In Situ Vitrification

SUMMARY

The Geosafe planar in situ vitrification (ISV) process is one of the technologies being considered for treatment of drummed uranium/oil waste uncovered at the 618-4 Burial Ground in fiscal year (FY) 1998. The ISV process uses electricity to melt a selected area of soil/waste to produce a glass form that is very durable and is also an acceptable waste form for disposal in the Environmental Restoration Disposal Facility (ERDF).

The demonstration, performed by the Geosafe Corporation, used the ISV process to melt a 3.8-L (1-gal) can containing a representative sample of the drummed uranium/oil waste – depleted uranium chips and oil contaminated with various heavy metals, volatile organic compounds, and polychlorinated biphenyls (PCBs).

INNOVATIVE TECHNOLOGY DESCRIPTION

The full-scale concept using ISV to treat the drummed uranium/oil waste is to treat the drums surrounded by soil in a lined cell excavated within the burial ground. The drums would be individually breached within the cell, allowing the oil to seep into the surrounding soil and permit the escape of vapors to the soil during processing. The breached drums containing depleted uranium chips would then be covered with soil and further compacted to minimize internal void space. Each cell would be designed to treat more than 400 drums. The melting process would destroy or immobilize hazardous constituents into a vitrified monolith that could be broken into pieces and transported to the ERDF for disposal. During treatment, an off-gas collection and treatment system would be placed over the treatment cell.

BASELINE DESCRIPTION

There is no baseline technology. The presence of multiple phases, pyrophoric material, radioactivity, and hazardous constituents in the waste presented complex and potentially costly disposal issues that were not addressed through any established Hanford Site processes. Based on waste characterization results, an evaluation of applicable regulatory issues was performed and potential treatment/disposal technologies were investigated. Discussions were also held with representatives from other sites within the U.S. Department of Energy (DOE) complex facing similar waste management issues. The ISV process was selected as one potential option for treatment of this complex waste.

DEMONSTRATION DESCRIPTION

The treatability test was performed in a sand-filled barrel that was sealed inside a containment vessel. Gasses produced by heating the waste were treated on site. Funds to support Bechtel Hanford, Inc. project costs for this test were provided through the Mixed Waste Focus Area, part of DOE's Office of Science and Technology. Geosafe performed the treatability test at its own expense. The active (thermal treatment) part of the test was performed during a 12-hour period on August 30, 1999. The block of glass that was produced in the test was allowed to cool and removed from the test apparatus the following week. The glass block weighed more than 136 kg (300 lb). It was broken into pieces to observe the quality of the glass and obtain samples for laboratory analysis. Results from the laboratory analysis show that the hazardous constituents were successfully treated such that the glassified waste form is suitable for disposal at the ERDF.

DETAILS OF BENEFITS

Information collected from the treatability test will be used by Geosafe to help optimize the design and refine cost. The ISV process is one of several technologies being considered for treating the estimated 1,500 drums of uranium/oil waste at the 618-4 Burial Ground.

The information will also be shared with interested representatives from other DOE sites where there is potential for application of this type of treatment technology. Continued investigation of other treatment technologies that may be applied to drummed waste from the 618-4 Burial Ground is planned during FY 2000. Remedial actions are scheduled to resume at the 618-4 Burial Ground in FY 2001.

CONTACTS

Scott Petersen, BHI (509) 372-9126
Robert McLeod, DOE-RL (509) 372-0096